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TROOPER SCALE

SERVICE MANUAL

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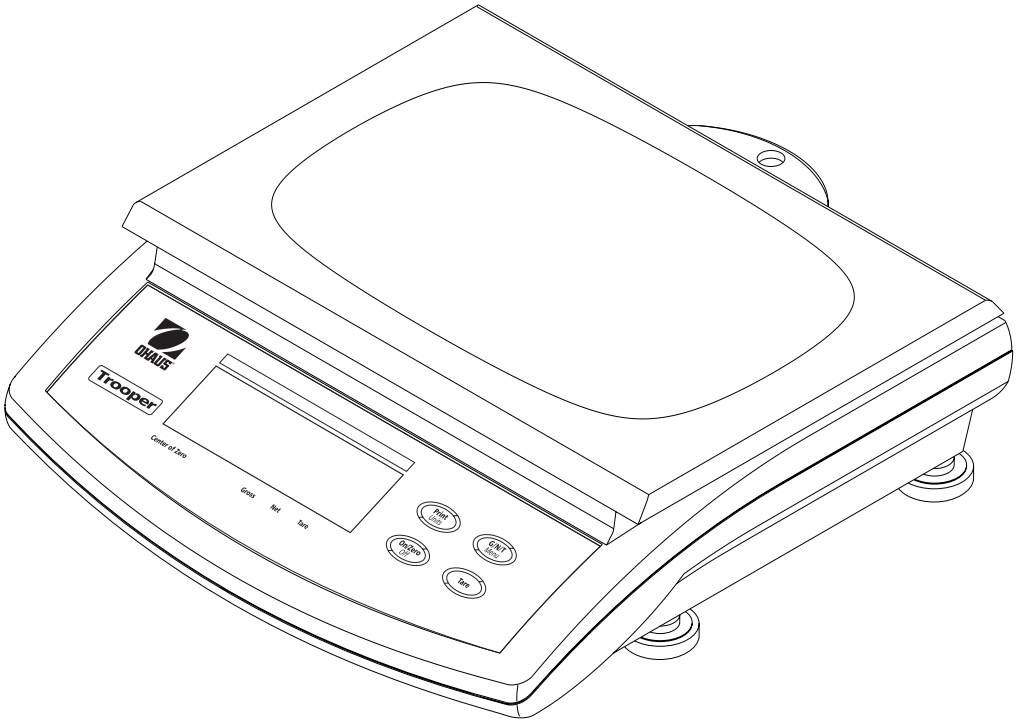

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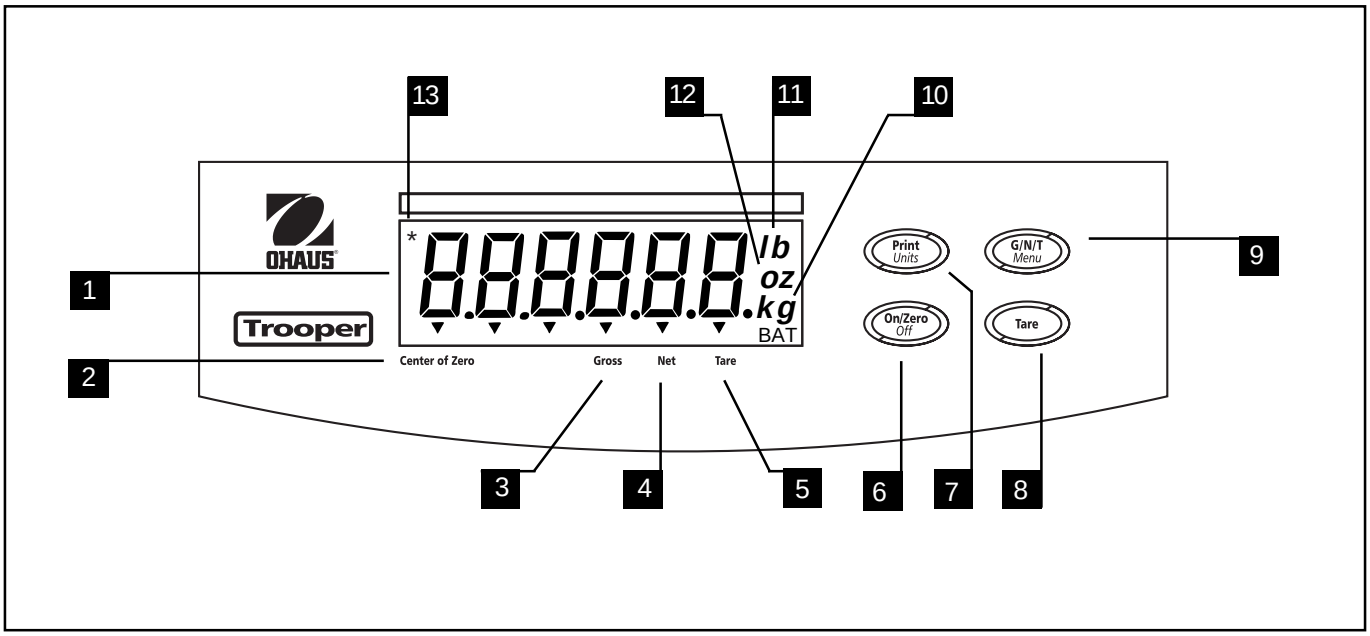
1.1 OVERVIEW OF CONTROLS AND DISPLAY FUNCTIONS



No.	Designation	Function
1	Display	LCD display, indicates weight, modes and setup information.
2	Center of Zero	LCD indicator prompt, indicates center of zero when within +/- 0.25d.
3	Gross	LCD indicator prompt, indicates gross weight.
4	Net	LCD indicator prompt indicates net weight.
5	Tare	LCD indicator prompt indicates tare weight.
6	ON/ZERO/OFF button	Turns Scale on or off. Secondary use, provides zero function.
7	Print/Units button	Short press, prints data which is displayed on the Scale. Long press, changes unit of measure. Longer press, enters counting mode. When in menus, each press advances horizontally through the menus. Finalizes a menu selection.
8	Tare button	When pressed, enters tare value into memory.
9	G/N/T/Menu button	Recalls Gross/Net/Tare. Long press allows entry into menus. When in menus, advances through individual menu items.
10	kg g	LCD indicator, when lit, indicates weight in kilograms. LCD indicator, when lit, indicates weight in grams.
11	lb	LCD indicator, when lit, indicates weight in pounds.
12	oz	LCD indicator, when lit, indicates weight in ounces.
13	*	Stability indicator, when lit, indicates stable weight.

CHAPTER 1 INTRODUCTION

1.2 INTRODUCTION

This service manual contains instructions for the repair and maintenance work to be performed by service engineers on the Trooper Scales. It is assumed that the reader is familiar with the operation of the Scale and can refer to the relevant operating instructions when necessary.

This manual covers maintenance on the following:

Trooper Scales (capacities 3kg, 6kg, 15kg and 30kg.)

The contents of this manual is contained in five chapters.

Chapter 1 Introduction - Contains information regarding service facilities, tools and test equipment, test masses, and specifications.

Chapter 2 Theory of Operation - Contains a basic information on circuit and loadcell operation.

Chapter 3 Troubleshooting - Contains a diagnosis/diagnostics chart and error code table.

Chapter 4 Maintenance Procedures - Contains preventive maintenance procedures, performance tests and adjustments, repair procedures, service mode procedures, and calibration procedures.

Chapter 5 Drawings and Parts List - Contains exploded view of Trooper Scale identifying all serviceable replacement components with parts list.

Before servicing the scale, you should be familiar with the Instruction Manual which is packed with every Trooper Scale.

1.3 SERVICE FACILITIES

To service the Ohaus Trooper Scale, the service area should meet the following requirements:

DO NOT SERVICE the scale:

- Next to open windows or doors causing drafts or rapid temperature changes.
- Near air conditioning or heat vents.
- Near vibrating, rotating or reciprocating equipment.
- Near magnetic fields or equipment that generates magnetic fields.
- On an unlevel work surface.
- Allow sufficient space around the instrument for ease of operation and keep away from radiating heat sources.

1.4 TOOLS AND TEST EQUIPMENT REQUIRED

In order to properly service the Ohaus Trooper Scales, a standard electronic tool kit is required. No special tools and test items are required.

1.4.1 Special Tools

None required.

1.4.2 Standard Tools and Test Equipment

1. Digital Voltmeter (DVM) - Input impedance of at least 10 megohms in the 1 Volt dc position.

2. Standard Electronics tool kit

1.5 TEST MASSES REQUIRED

The masses required to test the Ohaus Trooper Scales must meet the requirements of ASTM Class 4 Tolerance. The mass values are listed in Table 1-1.

TABLE 1-1. TROOPER CALIBRATION MASSES

Cal in kg:	**Span cal choices**	**Linearity cal (fixed)**
TR3RS	1, 2, 3kg	2 & 3 kg
TR6RS	2, 4, 6kg	4 & 6 kg
TR15RS	5, 10, 15kg	10 & 15 kg
TR30RS	10, 20, 30kg	20 & 30 kg
Cal in lb:	**Span cal choices**	**Linearity cal (fixed)**
TR3RS	2, 4, 6 lb	4 & 6 lb
TR6RS	5, 10, 15 lb	10 & 15 lb
TR15RS	10, 20, 30 lb	20 & 30 lb
TR30RS	20, 40, 60 lb	40 & 60 lb

1.6 SPECIFICATIONS

Complete specificatons for the Ohaus Trooper Scales are listed in Tables 1-2 and 1-3 . When a scale has been serviced, it must meet the specifications listed in the tables. Before servicing the scale, determine what specifications are not met.

TABLE 1-2. TROOPER MODEL SPECIFICATIONS

Standard Models	**TR3RS**	**TR6RS**	**TR15RS**	**TR30RS**
Default Capacity X Readability (lb)*	6lb X 0.001lb	15lb X 0.002lb	30lb X 0.005lb	60lb X 0.01lb
Default Capacity X Readability (kg)*	3kg X 0.0005kg	6kg X 0.001kg	15kg X 0.002kg	30kg X 0.005kg
Default Capacity X Readability (g)	3000g X 0.5g	6000g X 1g	15000g X 2g	30000g X 5g
Default Capacity X Readability (oz)	48oz X 0.02oz	240oz X 0.05oz	480oz X 0.1oz	960oz X 0.2oz
NTEP Capacity X Readability (lb)	6lb X 0.002lb	15lb X 0.005lb	30lb X 0.01lb	60lb X 0.02lb
NTEP Capacity X Readability (kg)	3kg X 0.001kg	6kg X 0.002kg	15kg X 0.005kg	30kg X 0.01kg
NTEP Capacity X Readability (g)	3000g X 1g	6000g X 2g	15000g X 5g	30000g X 10g
NTEP Capacity X Readability (oz)	48oz X 0.05oz	240oz X 0.1oz	480oz X 0.2oz	960oz X 0.5oz
Linearity (g)	± 0.5g	± 1.0g	± 2.0g	± 5.0g
Item Number	**TR3RS-2E0**	**TR6RS-2E0**	**TR15RS-2E0**	**TR30RS-2E0**

* Default capacity and readability are dependent on calibration unit selected. The table above assumes that the calibration unit is the same as the displayed unit listed.

TABLE 1-3. TROOPER GENERAL SPECIFICATIONS

General Specifications	
Platform Size (w x d) (in/cm)	13.5 X 9" / 34 X 23
Scale Dimensions (w x d x h) (in/cm)	13.5 X 14.5 X 4.5 / 34.3 X 36.8 X 11.4
Shipping Dimensions (w x d x h) (in/cm)	17 X 17 X 8.5 / 42.2 X 42.2 X 21.6
Weight (lb/kg)	8.6 / 3.9
Resolution NTEP	1:3000
Resolution Maximum	6,000 - 7,500 depending on model
Stabilization time	1 - 4 seconds depending upon filter selection
Keyboard	4 function membrane switches
Weighing units	lb, kg, g, oz
Display	Backlit LCD, 25.4mm, 1"
Power	AC Adapter or 6 alkaline C-type batteries
Typical Battery Life	Up to 100 hours
Span Calibration	1/3 to full capacity
Linearity Calibration (3-point calibration)	All models
Auto-zero tracking	Off, 0.5, 1, or 3 divisions
Construction	Stainless steel weighing pan, ABS plastic housing
Protection	IP43
Operating Temperature	14°F to 104°F / -10°C to 40°C
Storage Temperature	-40°F to 140°F / -20°C to 60°C

NOTE: All Trooper models meet the requirements of Approval Agencies: UL, FCC, CSA, CE. NTEP approval.

CHAPTER 2 THEORY OF OPERATION

2.1 TROOPER THEORY OF OPERATION

This chapter contains information on the basic theory of operation of the Loadcell and scale circuit descriptions of the printed circuit board. An exploded view drawing is included in Chapter 5 which identifies all servicable components of the scale. The descriptions in this manual refer to the name of the components identified in the exploded view drawing.

2.2 LOADCELL THEORY

The Loadcell assembly used in Trooper balances is part of a Spider Assembly. The Spider Assembly consists of two spider shaped brackets in which the Loadcell is mounted in between in a sandwich fashion. The Spider Assembly holds the Loadcell in proper alignment with preadjusted down-stop screws which are locktited. The bottom half of the Spider Assembly is mounted to the base of the scale. The upper half of the Spider Assembly forms the sub-platform for the scale. The platform assembly is mounted directly to this. Loadcells may not be ordered as a replacement part since they are part of the Spider Assembly.

For electrical components, refer to schematic diagram Figure 5-2. For mechanical components, refer to Figure 5-1. One basic type of Loadcell is used in the Trooper balances. The Loadcell contains four Strain Gauges in a full bridge configuration. The full bridge has two Strain Gauges mounted on top of the Transducer and two mounted on the bottom. A temperature compensation sensor is also mounted on the top of the Loadcell.

The Loadcell consists of an aluminum beam with 4 Strain Gauges bonded at the hinged areas (thinnest part of the beam). Two of the Strain Gauges are located on top of the beam and two on the bottom. These 4 electrical strain gauges are wired to form a Wheatstone bridge. When a load is placed on the beam, it bends at the hinged areas. The bending changes the resistance of the Strain Gauges and the resulting resistance output from the Wheatstone bridge is proportional to the load. Six Down Stop screws which are part of the upper Spider Assembly engages and limits the external load at slightly over full load capacity and limits the bending of the beam, preventing damage due to overloading. The Spider Assembly does not contain up-stop screws which protects the Transducer assembly from exceeding maximum upward movement.

2.3 PRINTED CIRCUIT BOARD THEORY (See figure 2-1)

2.3.1 Power Supply Circuit U12

Power to the scale is supplied by a 9 V dc, 500mA Power Adapter to connector J7 or by 6 "C" size Alkaline batteries. Power is regulated through U12 (3-terminal positive voltage regulator) to output a regulated +5 V dc which supplies the board.

2.3.2 Power Monitor Circuit U9

Battery voltage is monitored by a power monitor circuit U9. When the battery voltage goes low to a preset point, a reset signal (Low Bat) is sent from the power monitor circuit to the microprocessor U7. The microprocessor activates the display which indicates a low battery voltage condition.

CHAPTER 2 THEORY OF OPERATION

2.3 PRINTED CIRCUIT BOARD THEORY (Cont.)

2.3.3 Microprocessor U7

The microprocessor U7 contains a built in RAM, ROM and an LCD driver. Crystal Y1 operates at a frequency of approximately 4.00 MHz and is used to control the frequency of the microprocessor. The microprocessor provides serial data to the LCD display as well as parameter storage to EEPROM U11. A TTL level signal is also provided to U1 (Max 202) for RS232 communications.

2.3.4 MELSI U8

The MELSI, U8 is a digital controller used in conjunction with the A/D Converter. It provides all digital functions required to run two independent A/D channels. The oscillator of the MELSI works with an external crystal (Y2) which operates at a frequency of 11.0592MHz.

2.3.5 Memory Storage

The EEPROM U11 is the user memory storage device for the indicator. It contains 1024 bits of memory and stores the calibration data and the selected units which are enabled and disabled. When the scale is turned off, all previous settings are retained.

2.3.6 LCD Display Information

The display information for the LCD comes directly from microprocessor U7 and is decoded with it's internal circuits. The LCD is backlit by panel BL1 and driver circuitry BL2 operated from BKLIT signal from microprocessor U7.

2.3.7 Display ON/OFF

The unit contains an ON/OFF button. There is a power-save mode in the software. When this feature is enabled, the scale will automatically turn off after 5 minutes after last keypad operation.

2.3.8 A/D Converter

The A/D converter takes the analog input voltage from the load cells and produces a digital output code which represents the analog input. This is derived through U3, U4 and U5 circuitry. The SEN line is to compensate for temperature influence. Two jumpers Jump1 and Jump 2 may short the SEN and EXC for a four wire system.

2.3.9 Load Cell Excitation Voltage

A six (6) wire interface for the analog load cells is provided at J4 located on the PC board. Excitation voltage for the load cells is +5 Vdc.

2.3.10 RS232 Operation

The RS232 half-duplex operation is controlled by the microcontroller U1, MAX 202. Signals supported are RXD, TXD and GND. There is no handshake interface. The serial port may receive the external Tare, Zero and Print command in ASCII code.

2.3 PRINTED CIRCUIT BOARD THEORY (Cont.)

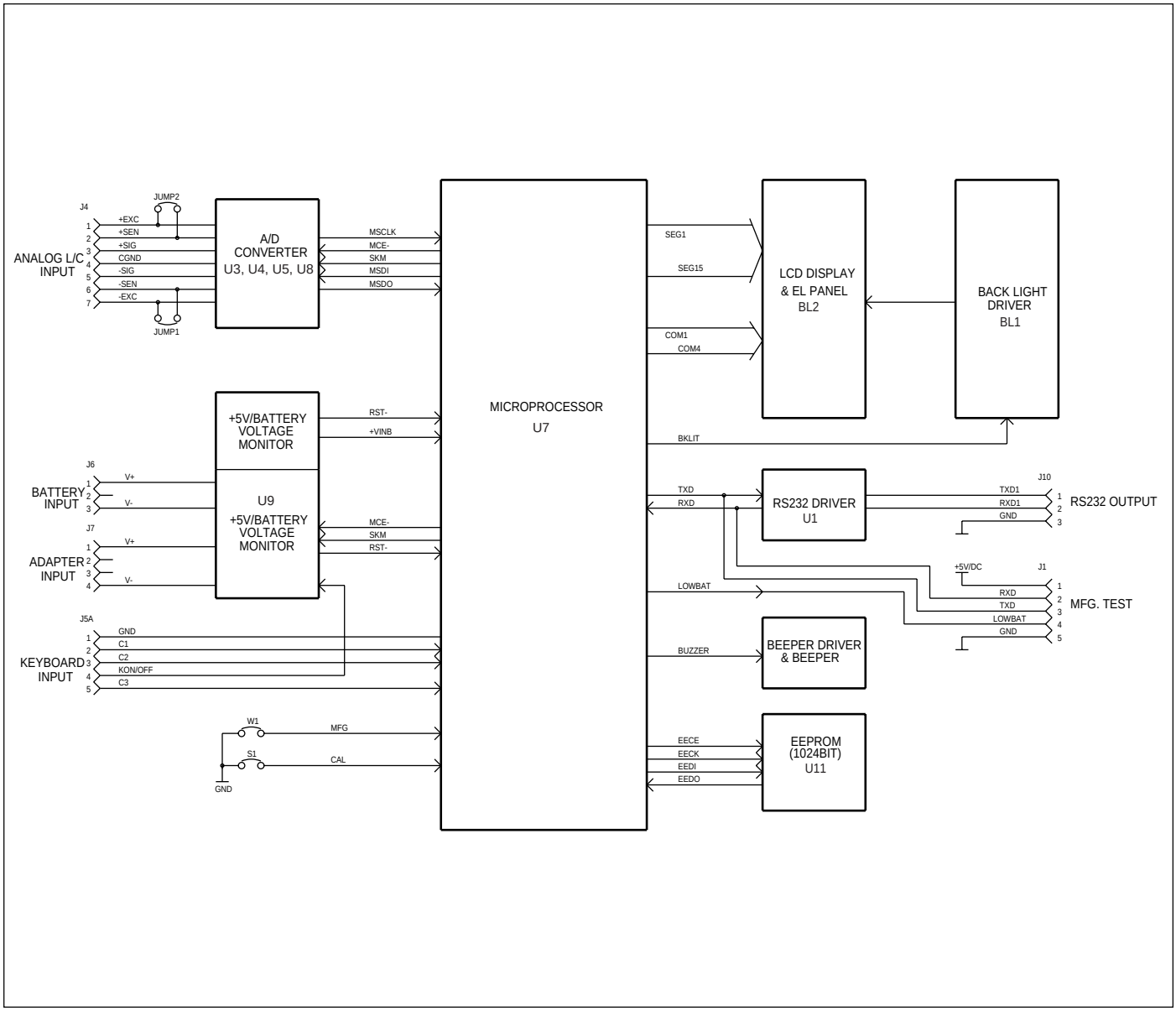


Figure 2-1. Trooper Block Diagram.

3.1 TROUBLESHOOTING

This section of the manual specifies problem areas of the scale which can occur. Information is contained to isolate specific problems using Table 3-1, Diagnostic Guide, and Table 3-2, Error Codes. Follow all directions step by step. Make certain that the work area is clean and use care when handling components of the scale.

3.2 DIAGNOSTIC GUIDE

Table 3-1 is a diagnostic guide designed to help locate the problem area quickly and easily. To use the table, first locate the symptom that you are observing. Follow the symptom column and review the probable cause column and remedy column. The probable causes are listed with the most common cause first. If the first remedy does not fix the problem, proceed on to the next remedy. Before attempting to repair the scale, read all chapters of this manual to familiarize yourself with the scale components and operation. Do not attempt repairs unless you fully understand the operation of the scale.

3.2.1 Diagnosis

1. Isolate and identify the symptom.
2. Refer to Table 3-1 Diagnostic guide and locate the symptom.
3. Follow the suggested remedies in the order that they appear.
4. Perform the indicated checks, or see the appropriate section of the manual.
5. Repair or replace the defective section of the scale.

NOTE:
If more than one symptom is observed, it is necessary to approach one area at a time, and also remember, that the symptoms may be interrelated.

In the event that erratic or fluctuating weight readings are observed, it is necessary to isolate the problem to either the mechanical area or the electronic area of the scale.

If a problem arises that is not covered in this manual, contact:

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Fax: 973-593-0359

In the United States call toll free, 800-526-0659 between 8:00 a.m. and 6:00 p.m. EST.

TABLE 3-1. DIAGNOSTIC GUIDE

SYMPTOM	PROBABLE CAUSE(S)	REMEDY
Unit will not turn on.	Adapter not plugged in or properly connected.	Check power cord connections. Make sure adapter connector is plugged all the way into the Scale.
	Batteries dead or not properly installed.	Check battery connector. Check orientation of the batteries. Replace batteries.
Cannot zero Scale, or will not zero when turned on.	Membrane switch failure.	Check functions of membrane switch.
	Load on scale exceeds allowable zero % entered in ZERO parameter of Setup menu.	Remove load on scale to less than entered zero %. Change allowable zero % in ZERO parameter of Setup menu.
Center of Zero display indicator erratic or does not appear with no load on scale platform.	Retain Zero Data is enabled in scale menu.	Normal operation when this feature is disabled.
	Scale platform motion or disturbances exceed center of zero criteria.	Remove disturbances or reduce motion. Increase AZT level in readout menu. Increase averaging level in readout menu.
Cannot display weight in desired weighing unit.	Desired unit not set to ON in Read menu.	Enable desired unit in Readout menu.
		Conversion too large (typically in g).

TABLE 3-1. DIAGNOSTIC GUIDE (Cont.)

SYMPTOM	PROBABLE CAUSE(S)	REMEDY
RS232 not working.	RS232 communication parameters set up incorrectly. Improper or loose cable connections.	Verify communication parameters. Check cable connections.
Unable to calibrate unit.	Software Lockout switch set to ON and Lock Switch on the circuit board set to open position. Incorrect value for calibration mass.	Set LCL to OFF in the LocSW menu, and set Lock Switch on the circuit board to ON position. Use correct calibration mass.

3.3 ERROR CODES

This scale is equipped with software which will display an error condition when it occurs. When a problem occurs using the scale, the display will indicate an error code. Review the listed codes and follow instructions to correct the problem. Table 3-2 Error Codes, describes the various error codes which can appear on the display and specifies the probable reason and remedy.

TABLE 3-2. ERROR CODES

Indication	Problem
LoBat	Is indicated when batteries are weak. Approximately 20 minutes of operating time remain. Replace batteries as soon as possible.
Error 1	Indicates an overload condition. Remove overload condition.
Error 2	Indicates an underload condition.
Error 7	EEPROM data incorrect. Check scale settings.
Error 14	Zero exceeds ZERO% and cannot be zeroed.
Error 21	Calibration data does not match current full scale, Grad and Cal Point settings. Settings must be restored or the Scale must be recalibrated using the current settings.

CHAPTER 4 MAINTENANCE PROCEDURES

4.1 PREVENTIVE MAINTENANCE

Ohaus scales are precision instruments and should be carefully handled, stored in a clean dry area which is dust free, and cleaned periodically. It is recommended that when a scale has had chemicals or liquids spilled on it, the scale should be cleaned as soon as possible. Use warm water on a damp cloth to clean all exterior surfaces. Do not leave a mass on the scale when not in use. When moving the scale from a storage area which is at a different temperature than the area where it is to be operated, allow sufficient time for the scale's mechanism to temperature stabilize. This time can vary quite a bit depending upon the temperature differences. Allow one (1) hour for each 5 degrees Fahrenheit temperature change before using the scale. Also, after turning the scale ON, allow one hour after temperature stabilization for the scale electronics to stabilize.

4.1.1 Preventive Maintenance Checklist

On a regular basis, the scale should be inspected and checked as follows:

1. Remove the Platform and inspect and clean the area beneath the Platform. Remove any accumulated dirt or dust.

2. Clean the outside of the scale using a damp cloth with water.

CAUTION

DO NOT USE CHEMICAL CLEANERS OR SOLVENTS OF ANY TYPE. SOME CLEANERS ARE ABRASIVE AND MAY AFFECT THE FINISH OF THE SCALE.

3. Check the Power Cord for broken or damaged insulation.

4. Make a visual inspection for faulty connectors, wiring, and loose hardware.

4.2 TESTING

Before servicing the Trooper scale, an operational test and various performance tests should be made to ascertain whether or not the scale meets specifications. Turn the scale on and allow it warm up for at least one hour before performing these tests. Make sure the test area is free from drafts and the surface that the scale rests on is level and vibration free. The masses used for the performance tests and adjustments must meet or exceed ASTM Class 4 Tolerance.

4.2.1 Operational Test

1. Connect the AC Adapter into a suitable power source and connect to the scale.

4.2.1.1 Segment Display Test

1. Turn the scale on, all segments are enabled and displayed breifly followed by a software revision number. This is a segment display test. Figure 4-1 is a full display test.

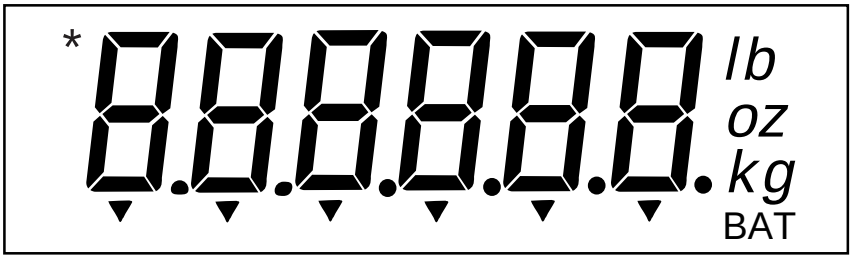
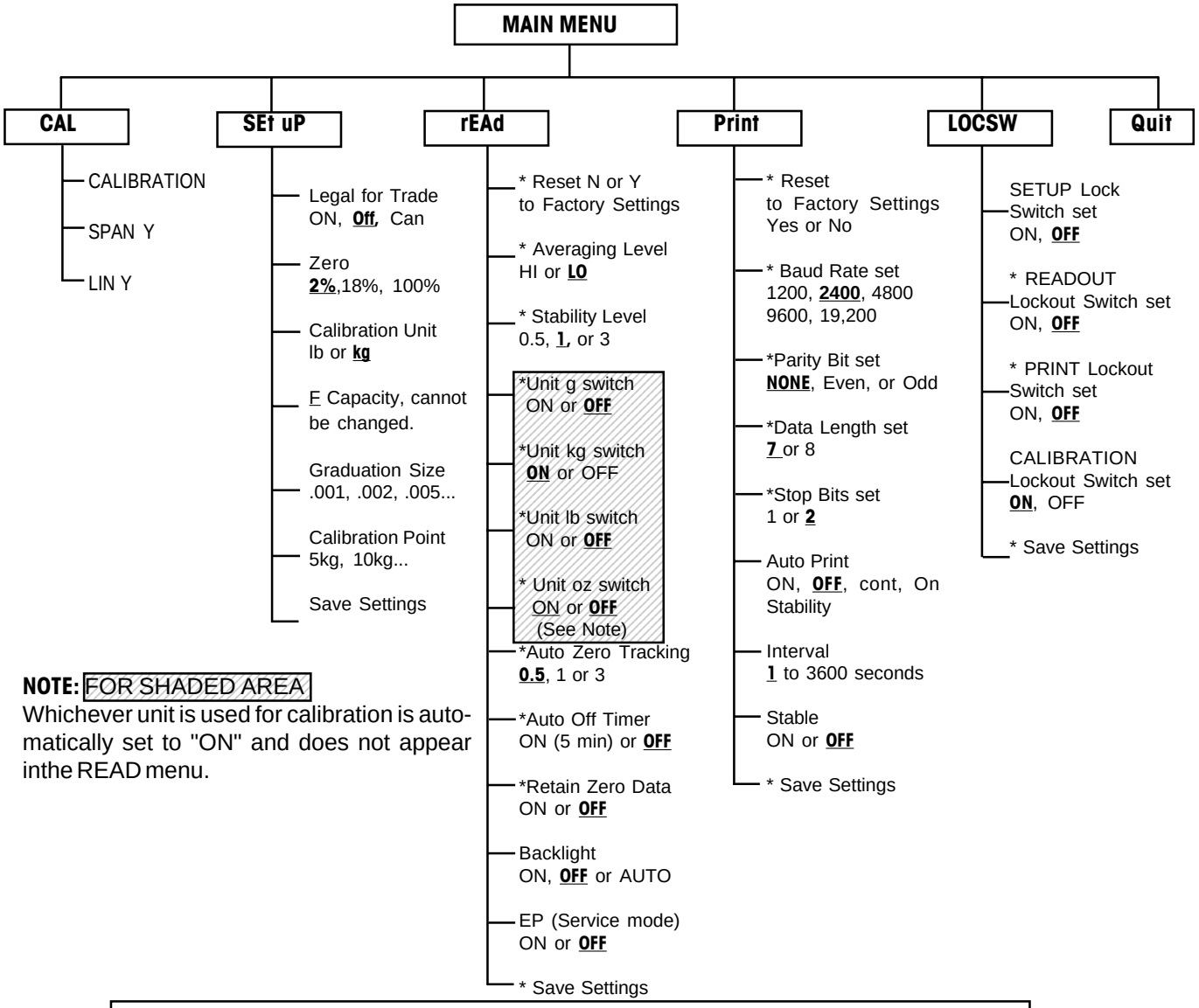


Figure 4-1. Segment Displays

4.2.2 Menu Structure

Programmable features of the Trooper Scales are contained in menus which are accessed through the front panel control switches. Figure 4-2 illustrates the menu structure.



NOTE: FOR SHADED AREA
Whichever unit is used for calibration is automatically set to "ON" and does not appear inthe READ menu.

Press **(G/N/T/*MENU*)** to enter the display submenu or select a displayed setting.

Press **(PRINT/*UNITS*)** to change the displayed submenu or setting.

Factory default settings are shown in **underlined and boldface** type.

When CAL switch on the circuit board is in the LFT position, all of the menus can be reached except CALIBRATION Menu, but only the submenus which are marked '*' can be setup, see menu structure.

Figure 4-2. Trooper Scale Menu.

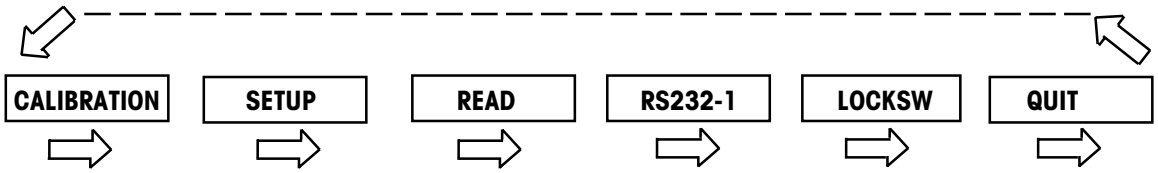
4.2.3 Trooper Switch Functions

The four button switches located on the right-hand side of the scale provide basic operation and menu setups. Please read the following information before pressing any of these buttons.

BUTTONS	PRIMARY FUNCTION	SECONDARY FUNCTION
ON/ZERO ***OFF***	Short press - Turns scale **ON** if OFF. Long press - Turns scale **OFF** if ON.	When scale is ON, short press zeros the scale.
PRINT ***UNITS***	Short press - Sends current weight to printer. Long press - Changes **UNITS**.	When in MENU MODE: short press = **NO**.
G/N/T ***MENU***	Short presses - Toggles display between Gross/Net/Tare if tare value is stored. No action for 5 secs., scale display returns to **NET**. Long press - Enter **MENU**.	When in MENU MODE: short press = **YES**.
TARE	Short press - enter **TARE**.	

4..2.4 Trooper Scale Menu Operation

This section describes the menu operation. The menu permits matching the scale to specific weighing needs. In the menu, you can change the settings of the scale and activate functions. The Main Menu contains 6 sub menus. Each of the six sub menus are described in detail in the Operating Manual supplied with the scale.



4.2.4.1 How to Enter the Menus

To enter the menus, press and hold the **G/N/T *MENU*** button until MENU appears. When you release **G/N/T *MENU*** button, Setup appears.

4.2.4.2 How to Select a Specific Menu

A short press on the **PRINT *UNITS*** button = NO. When in MENU MODE short presses will advance to the next menu as shown above. When QUIT is reached, the next press on the **PRINT *UNITS*** button will return to the CALIBRATION or SETUP menu.

4..2.4 Trooper Scale Menu Operation (Cont.)

4.2.4.3 How to Enter an Individual Menu
A short press on the **G/N/T *MENU*** button = **YES** and you can enter a specific menu.

4.2.4.4 How to Enter an Individual Menu Item
When in any menu, a short press on the **G/N/T *MENU*** button = **YES** and you can enter a specific menu item. To advance through a given menu, make short presses on the **PRINT *UNITS*** =**NO** button.

4.2.4.5 How to Save and Store an individual menu item
When a menu item has been changed once the desired selection is shown, make a short press on **G/N/T *MENU*** button, Quit appears on the display. If NO is selected by pressing the **PRINT *UNITS*** button, the next menu item appears. If yes is selected by pressing **G/N/T*MENU*,** StorE? appears. Pressing the **G/N/T *MENU*** button will store the change and return the scale to a weighing mode. If NO is selected, the menu change is ignored and the scale is returned to weighing mode.

4.2.4.6 How to Quit the Menus
A short press on the **PRINT *UNITS*** button = **NO**. When in MENU MODE, short presses will advance through the menus until QUIT is reached. To quit, make a short press on the **G/N/T *MENU*** button, StorE? appears, answer YES to save changes and the scale returns to the weighing mode, or NO to ignore changes and return to the weighing mode.

4.2.5 Calibration

Span calibration ensures that the Scale reads correctly within specifications. For best results, calibrate at full capacity. Calibration unit can be set to either kg or lb.
NOTE: When the Scale is used in Legal for trade applications, the calibration menu is locked out and is not accessable. This is to prevent unauthorized personnel from changing calibration.

IMPORTANT:

Before beginning calibration, <u>make sure masses are available</u>. If you begin calibration and realize calibration masses are not available, exit the menu. The Scale will retain previously stored calibration data. Calibration should be performed as necessary to ensure accurate weighing. You have a choice of either span or linearity calibration. Span calibration checks zero and full span calibration points. Linearity calibration checks zero, mid span and full span points.

Before calibrating the scale, first determine if a recalibration is really needed. Place the available calibration masses onto the platform. As each mass is added, the scale display should show the correct weight to within +/- 1 scale division. If the scale is within the tolerance, there is no need to recalibrate the scale.

If it is determined that the scale must be recalibrated **do not continue until you are certain that you have suitable calibration masses**.

If calibration masses are available you must select the correct calibration units (pound masses or kilogram masses) before calibrating the scale. The desired unit can be chosen in the setup menu.

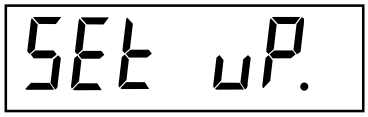
After the desired calibration unit has been chosen, advance to the LOCSW menu to turn the calibration lock switch off. This software lock is in place to prevent accidental calibration.

4.2.5 Calibration (Cont.)

Procedure

TURNING CALIBRATION LOCK SWITCH OFF

To turn the software lock off:



Press and hold the **G/N/T/*MENU*** button until MENU appears. Release it and SETuP appears. (if already in the main menu, skip to the next step).

Repeatedly press the **PRINT/*UNITS*** button until LOCSW is displayed.

Repeatedly press the **G/N/T/*MENU*** button until LCL ON is displayed.

Press the **PRINT/*UNITS*** button to scroll through the choices until LCLOFF appears.

Press the **G/N/T/*MENU*** button repeatedly until the scale returns to weighing

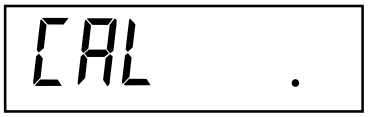
Before calibrating, make sure that you have the correct masses available:

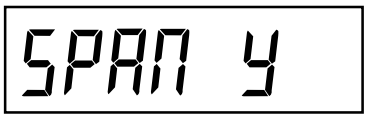
TABLE 4-1. CALIBRATION MASSES.

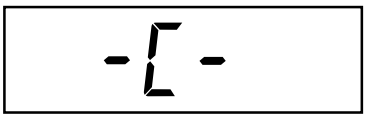
Cal in kg:	**Span cal choices**	**Linearity cal (fixed)**
TR3RS	1, 2, 3kg	2 & 3 kg
TR6RS	2, 4, 6kg	4 & 6 kg
TR15RS	5, 10, 15kg	10 & 15 kg
TR30RS	10, 20, 30kg	20 & 30 kg
Cal in lb:	**Span cal choices**	**Linearity cal (fixed)**
TR3RS	2, 4, 6 lb	4 & 6 lb
TR6RS	5, 10, 15 lb	10 & 15 lb
TR15RS	10, 20, 30 lb	20 & 30 lb
TR30RS	20, 40, 60 lb	40 & 60 lb

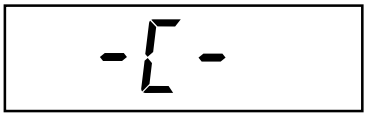
4.2.5 Calibration (Cont.)

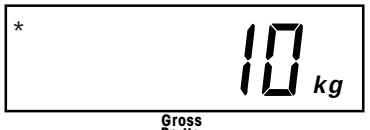
For span calibration, there are a number of choices for calibration. The highlighted number is the default. To change the span calibration value read the setup section of the menu. In the Setup menu, change the CP selection to the desired value. When the desired selection has been chosen and the masses are available, you are ready to begin the calibration routine.











NOTE: If the Scale is to be used for legal for trade applications, it must be calibrated and the LFT Lock Switch must be set ON to lock out the menus. Refer to paragraph 4.2.6 for sealing for legal for trade use.

Procedure

SPAN CALIBRATION

With the Scale ON, press and hold the **G/N/T/*MENU*** button until MENU is displayed. When you release the **G/N/T/*MENU*** button, CAL is displayed. If the display shows SETuP, read the section on turning off the Calibration Lock Switch or check the settings for legal for trade.

Press **G/N/T/*MENU*** button, SPAN Y is displayed.

Press **G/N/T/*MENU*** button, -C- is displayed. The scale MUST be stable during this period and is establishing a zero point. After a few seconds, the requested weight value is displayed.

Place the indicated mass on the platform. Keep the platform stable during this period. The sample illustration indicates a 15kg scale.

If at this point you are uncertain of the process or if the correct weights are not available, the calibration routine can be aborted by pressing the **PRINT/*UNITS*** button, or by turning the scale off by pressing and holding the **ON/ZERO/*OFF*** button.

Press **G/N/T/*MENU*** button, -C- is displayed while the Scale stores the reading and then displays the weight of the mass.

If the calibration was successful, the calibration mass is displayed and the calibration data is saved automatically. If unsuccessful, refer to the troubleshooting section.

Remove calibration masses from platform.

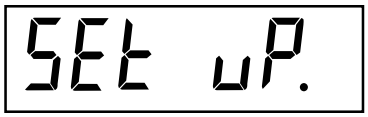
After the calibration routine is complete, check the scale again to see if the scale has been accurately calibrated. If so return to the lockout menu and restore the calibration software lock to “ON”:

4.2.5 Calibration (Cont.)

Procedure

TURNING CALIBRATION LOCK SWITCH ON

To turn the software lock on:



Press and hold the **G/N/T/*MENU*** button until MENU appears. Release it and SETuP appears. (if already in the main menu, skip to the next step).

Repeatedly press the **PRINT/*UNITS*** button until LOCSW is displayed.

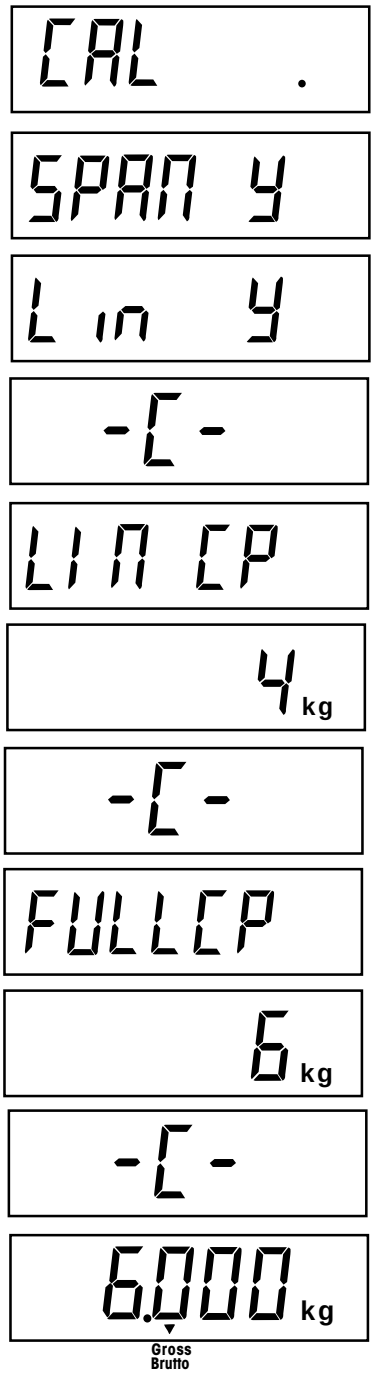
Repeatedly press the **G/N/T/*MENU*** button until LCLOFF is displayed.

Press the **PRINT/*UNITS*** button to scroll through the choices until LCLON appears.

Press the **G/N/T/*MENU*** button repeatedly until the scale returns to weighing

The scale is now ready for weighing.

4.2.5 Calibration (Cont.)



Procedure

LINEARITY CALIBRATION

As with span calibration, confirm that calibration is really required. If required, refer to page 20 and turn the Calibration Lock Switch off.

With the Scale ON, press and hold the button **G/N/T/*MENU*** until MENU is displayed. When you release the **G/N/T/*MENU*** button, CAL is displayed.

Press **G/N/T/*MENU*** button, SPAN Y is displayed.

Press **PRINT/*UNITS*** button, Lin Y is displayed.

Press **G/N/T/*MENU*** button, -C- is displayed. The scale MUST be stable during this period and is establishing a zero point. After a few seconds, the display flashes LIN CP twice and the requested weight value is displayed. The sample illustration indicates a 4kg mid point for a 6kg scale. (Linearity calibration for Trooper is 0, 2/3 and full capacity).

Place the indicated mass on the platform. Keep the platform stable during this period.

Press **G/N/T/*MENU*** button, -C- is displayed. The scale MUST be stable during this period and is establishing a zero point. After a few seconds, the display flashes FULLCP and the requested weight value is displayed.

Place the indicated mass on the platform and press the **G/N/T/*MENU*** button -C- is displayed.

If linearity calibration was successful, the calibration mass is displayed and the calibration data is saved automatically. If unsuccessful, refer to the troubleshooting section.

Remove calibration masses from platform. After calibration, turn the Calibration Lock Switch On.

NOTE: If the Scale is to be used for legal for trade applications, it must be calibrated and the Lock Switch must be set to lock out the menus. Refer to paragraph 4.2.6 for sealing for legal for trade use.

4.2.6 Legal for Trade (LFT) Operation and LFT Sealing

Legal for Trade (LFT) operation is possible through a LFT Lock Switch located on the PC board. The Scale must be calibrated prior to performing this proceedure.

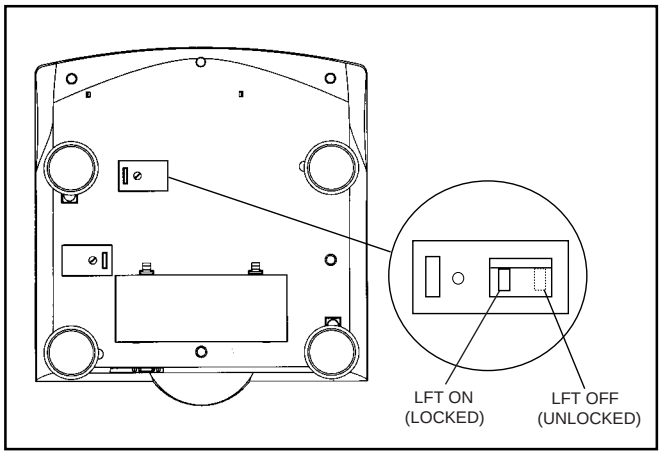


Figure 4-3. Lock Switch Location.

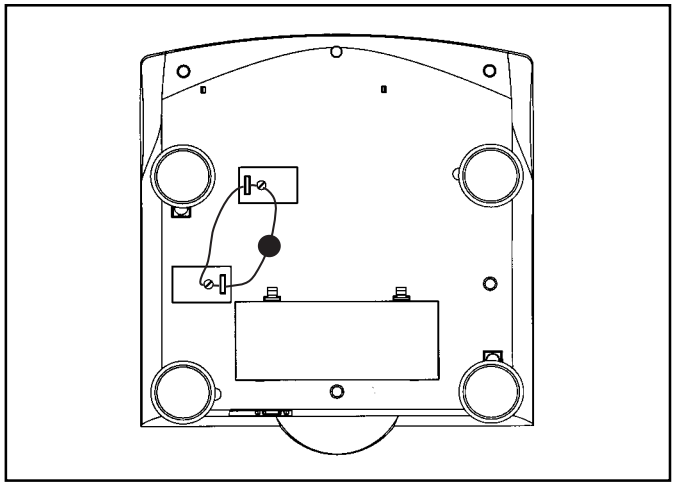


Figure 4-4. Sealing the Scale with a Lead Seal.

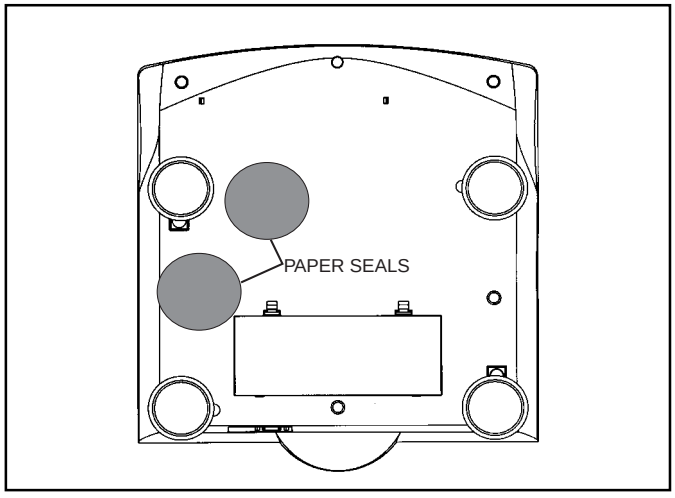


Figure 4-5. Sealing the Scale with a Paper Seal

Procedure

Set up Scale, and calibrate. After this is done, remove power from the Scale.

Turn the scale over in the position as shown and remove the Lock Switch cover plate.

Refer to the illustration at the left and notice the position of the LFT switch. To lock out the menus, slide the LFT switch to the position shown.

Replace the Lock Switch cover and housing screw cover. The two screws are cross drilled and can accept a wire seal.

NOTICE: The Trooper Scale has been tested and found to comply with Class lll requirements of NIST Handbook 44.

After the Scale has been tested and found to comply with local applicable regulations by a local weights and measures official, it may be sealed as follows:

LEAD AND WIRE SEAL

See illustration at left. Place wire seal through the holes in the screw and ribs as shown and compress the lead seal in place.

PAPER SEAL

If an audit trail or paper seal will be used, place a paper seal over both access covers.

4.2.7 Performance Tests

Accurate performance of the Trooper scales is determined by a series of three performance tests. The displayed readings are compared with the tolerances listed in Table 4-2. Tolerance values are expressed in counts. A one count change is equal to the last digit shown on the scale display.

TABLE 4-2. TYPES OF PERFORMANCE TESTS

PERFORMANCE TEST	TOLERANCE - COUNTS			
	3kg	6kg	15kg	30kg
Repeatability (SD)	1	1	1	1
Off Center Load	±1	±1	±1	±1
Linearity	±2	±2	±1	±2

The following performance tests are used to evaluate the scale operation before and after repairs. Each scale tested must meet the requirements specified in each test as well as the specifications listed in Tables 1-2 and 1-3 depending upon the model. Before proceeding with the following tests, all the procedures starting with paragraph 4.2 must have been accomplished on the scale first.

4.2.7.1 Repeatabilty Test

To conduct a Repeatability Test, proceed as follows:

1. With the scale calibrated, place a mass on the Platform equal to the capacity of the scale. Record the reading.

2. Remove the mass from the Platform, the scale should return to 0g. Record the reading.

3. Repeat steps 1 and 2 ten more times. Subtract the lowest from the highest reading to determine the difference. Maximum allowable difference is as listed in Table 4-2.

4.2.7.2 Off-Center Load Test

The Off-Center Load Test is used to determine whether displayed weight values will be affected by moving the sample to different areas of the Platform. See Figure 4-6.

Place 1/2 of the scale capacity in the center of the Platform. Press the **ON/ZERO *OFF*** button to return the reading to zero. Move the mass halfway to the rear of the Platform and note the reading. Move the mass halfway between the center and the left edge front of the Platform and note the reading. Repeat this test for the right edge position and note the reading. Move the mass halfway to the front of the Platform and note the reading. Note any differences in the displayed weight reading at all positions. Maximum allowable change is per Table 4-2 for each of the listed scales four positions. Move back to center and tare if neccessary after each reading.

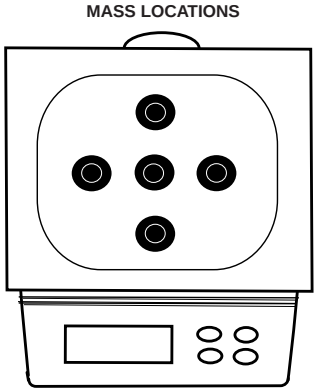


Figure 4-6. Off-Center Load Test Mass Locations.

4.2.7.3 Linearity Test

The Linearity test is used to determine the linearity of the scale throughout its operating range and is in accordance with the specifications listed in Tables 1-2 and 1-3.

NOTE:

The scale must pass the Off-Center Load test and Repeatability Test before the Linearity Test is performed.

This test is used to determine the linearity of the scale throughout its operating range.
Table 4-3 lists the suggested masses to be used for checking linearity on each scale model.
If the unit fails the linearity test, check the alignment of the transducer and re-assemble. If the transducer has been replaced, carefully check the alignment.

TABLE 4-3. LINEARITY TEST MASSES

CAPACITY	3Kg	6Kg	15Kg	30Kg
Ref. Mass.	100g	100g	100g	100g
Load 1	750g	1.5kg	3kg	7.5kg
Load 2	1.5kg	3kg	6kg	15kg
Load 3	2.25kg	4.5kg	9kg	22.5kg
Load 4	3kg *	6kg *	12kg *	30kg *

All masses are nominal values.
BE CERTAIN TO USE THE SAME REFERENCE MASS THROUGHOUT THE PROCEDURE.
* As close to full capacity as possible while allowing the 100g weight to read.

4.2.7.3 Linearity Test (Cont.)

Before beginning:

- Perform calibration.

Preliminary Weighings

Using the Load 3 and Load 4 weight values (Table 4-3), perform some preliminary weighings and make sure the display returns to zero after weighing.

1. Place Load 3 on the center of the Platform, read the displayed weight, then remove Load 3. If the display does not return to zero, press **ON/ZERO/*OFF*** and repeat this.

2. Repeat step 1 using Load 4.

After performing preliminary weighings, proceed with checking Linearity. If the scale does not return to zero, it must be repaired.

Test

1. Place the reference mass on the center of the Platform and record the exact value (all decimal places) displayed.

2. Remove the reference mass and verify that the display returns to zero. If it does not, disregard the reading, press **ON/ZERO/*OFF*** to rezero the display and take that reading again. See note above.

3. Place Load 1 on the center of the Platform and press **ON/ZERO/*OFF***.

4. Add the reference mass to the Platform and record the exact value displayed.

5. Remove the reference mass and verify that the display returns to zero. If it does not, disregard the reading, press **ON/ZERO/*OFF*** to rezero the display and take that reading again.

NOTE:

If after several attempts the display fails to return to zero, a repeatability problem is indicated and the scale must be serviced by an Ohaus Product Service Specialist.

6. Repeat steps 3 through 5 using Load 2, Load 3 and Load 4 as applicable.

7, Compare the reference weight readings. They should agree per table 4-2.

4.2.8 RS232 Interface Test

The RS232 Interface in the Trooper scale can have its performance monitored using an external printer or computer connected to the scale.

The RS232 Interface is a bi-directional interface which enables the scale to communicate with a printer or computer equipped with an RS232 serial port. An Print menu is in the scale. This menu enables various parameters such as Baud rate, Data bits, Stop Bits and Parity to be set in the scale.

The Print menu provides communication parameters which can be set to accommodate external printers or computers. It contains eight submenus: **Reset, Baud Rate**, **Parity Bit, Data Bits, Stop Bits**, **Auto Print**, **Interval, Stable**, and **save settings** which enable you to program RS232 port parameters.

Refer to Print menu and make sure all communications parameters are properly set.

4.2.8.1 Connecting the RS232 Interface

When the interface is connected to a computer, two way communication between the computer and scale is possible using the commands outlined in the RS232 Command Table 4-4. See Figure 4-7 for connections. When the scale is connected directly to a printer, displayed data can be output at any time by simply pressing **PRINT *UNITS***.

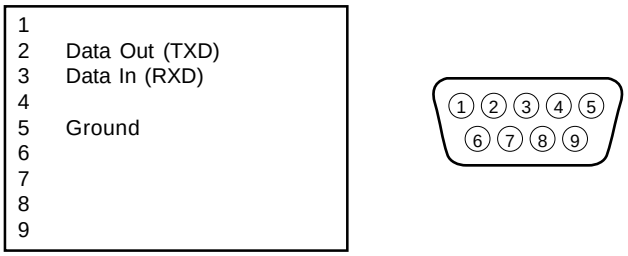


Figure 4-7. RS232 Interface Pin Connections.

4.2.8.1 Connecting the RS232 Interface (Cont.)

RS232 Commands

All communication is accomplished using standard ASCII format. Only the characters shown in the RS232 Command Table 4-4 are acknowledged by the scale. Invalid command response "ES" error indicates the scale has not recogonized the command. Commands sent to the scale must be terminated with a line feed (LF) or carriage return-line line feed (CRLF). Data output by the scale is always terminated with a carriage return - line feed (CRLF).

TABLE 4-4. RS232 COMMANDS

Command Character	Description
?	Print current mode: kg, g, lb, oz.
P	Same as pressing PRINT button.
T	Same as pressing TARE button.
Z	Same as pressing ZERO button.
xS	Print Stable only. Where x=0 Off, and x=1 On.
AS	Automatically send data when stable after motion.
xxxxS	Send at interval. Where xxxx=1 to 3600 seconds.
CS	Send as fast as possible (continuous print).
M	Increment to next enabled unit.

To turn auto printing, interval printing or continuous printing off, send P to reset normal printing mode.

4.2.9 Print Test

1. Remove all weight from the platform.
2. Press the **ON/ZERO/*OFF*** button once, 0.0g should be displayed.
3. Place a mass on the Platform.
4. Press **Print *UNIT***S button, the computer and or a printer should indicate the mass value.

NOTE: Print commands entered through the computer are temporary. When the scale is turned off, it will return to scale menu settings when turned on again.

4.3 REPAIR PROCEDURES

This section describes how to change individual components of the Trooper scales. When doing this, please refer to the exploded view drawings and spare parts lists in section 5.
Important: after replacing components, a functional check of the scale must always be carried out.

4.3.1 Replacing the Keypad Membrane

The keypad membrane is affixed to the upper housing of the scale. To replace the keypad, the scale must be disassembled to gain access to the keypad connections.

1. Remove power from the scale.

2. Carefully lift and remove the platform from the scale. You will find that one rubber foot remains attached to the platform, this is normal. This is used to ensure the platform is properly located on the weighing loadcell when replaced.

3. Turn the scale over on it's bottom and remove the six screws which hold the upper housing.

CAUTION
Use care in the next step as the keypad wiring is attached to the PC board.

4. Turn the scale over again to its normal upright position and carefully lift the upper housing from the bottom housing about two to three inches. Reach under the upper housing from the front and carefully disconnect the flexible cable from the PC board.

5. On the upper housing, lift up the defective keypad membrane (if necessary carefully prying it up with a knife) and gently peel it off the upper housing.

6. Carefully clean the upper housing keypad area (removing all traces of adhesive).

7. Peel off the protective film from the new keypad membrane and carefully affix the latter to the upper housing.

8. Press the keypad membrane down uniformly.

9. Position the upper housing in place over the scale and connect the flexible cable from the keypad to the socket on the PC board.

10. Reassemble the scale by replacing the six screws at the bottom of the scale which secure the upper housing.

11. Replace the platform on top of the scale.

4.3.2 Replacing the PC Board

The PC Board is located inside the scale towards the front. To replace the PC Board, it is necessary to disassemble the scale.

1. Remove power from the scale.

2. Carefully lift and remove the platform from the scale. You will find that one rubber foot remains attached to the platform, this is normal. This is used to ensure the platform is properly located on the weighing loadcell when replaced.

3. Turn the scale over on it's bottom and remove the six screws which hold the upper housing.

CAUTION
Use care in the next step as the keypad wiring is attached to the PC board.

4. Turn the scale over again to its normal upright position and carefully lift the upper housing from the bottom housing about two to three inches. Reach under the upper housing from the front and carefully disconnect the flexible cable from the PC board.

5. Remove the connector plugs from connectors J6 and J7 from the PC Board which is the battery and external power wires. See Figure 4-8.

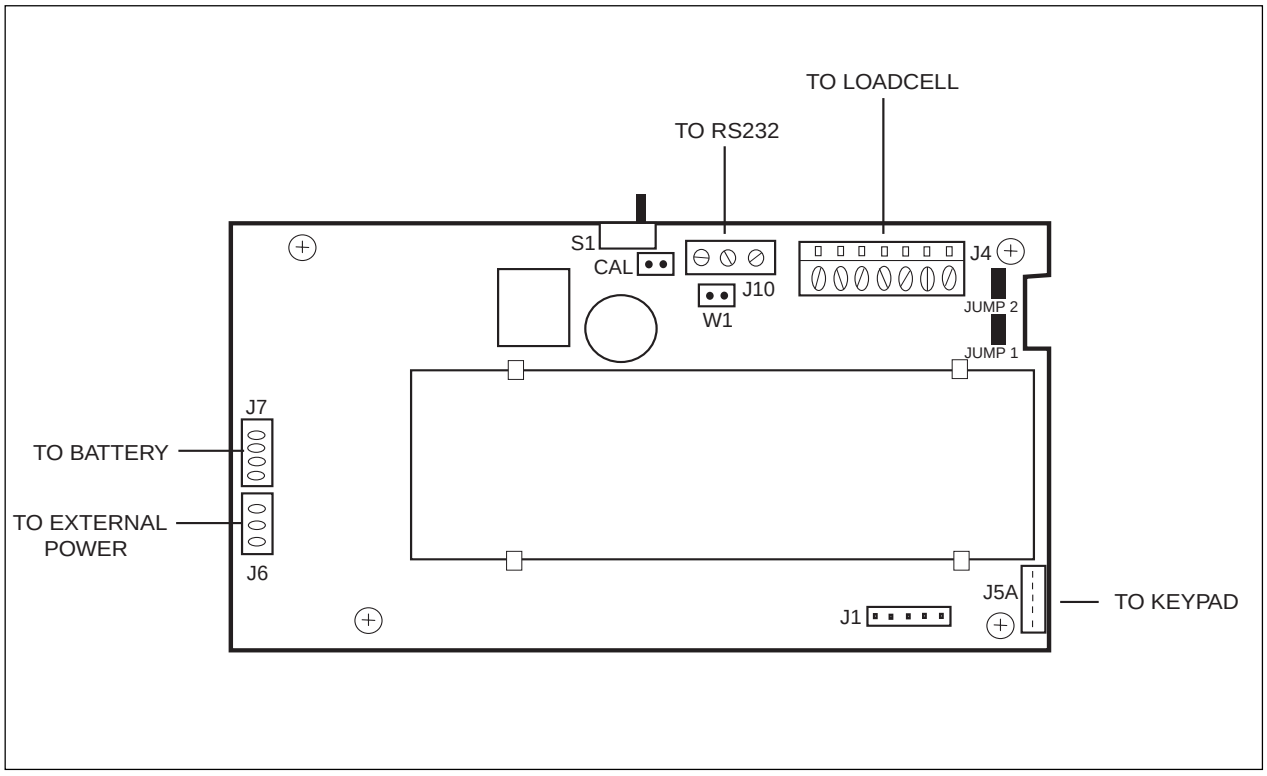


Figure 4-8. Connector Locations.

4.3.2 Replacing the PC Board (Cont.)

6. Carefully remove the wires coming from J10 which is the RS232 connector and J4 which is used to connect the loadcell. See figure 4-9 for wire color and locations.

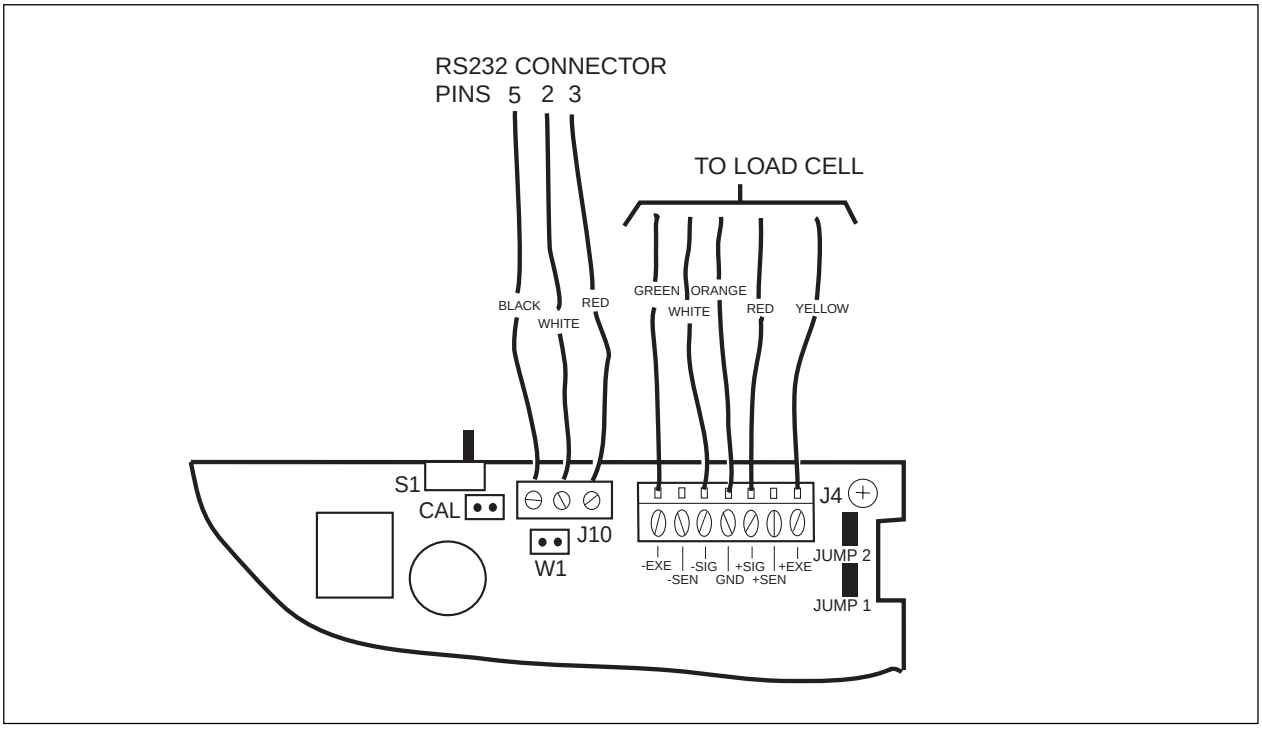


Figure 4-9. RS Connector and Loadcell Connector Wiring.

7. Remove the four corner screws on the PC Board

8. Replace the PC Board and install the four screws previously removed.

9. Replace the color coded wiring for connectors J4 and J10. Check color coded wiring is correctly installed.

10. Replace the connectors to J6 and J7 on the PC Board.

11. Position the upper housing in place over the scale and connect the flexible cable from the keypad to the socket on the PC board.

12. Reassemble the scale by replacing the six screws at the bottom of the scale which secure the upper housing.

13. Replace the platform on top of the scale.

14. After installation, check all operations, if possible, set the original customer settings back into the scale and calibrate the scale.

4.3.3 Replacing the Spider Assembly (Loadcell)

The Spider assembly is centrally located inside the scale and contains the loadcell. See Figure 4-10. This assembly is factory assembled and the downstops are preadjusted. There are no adjustments to be made on this assembly after installation.

1. Remove power from the scale.

2. Carefully lift and remove the platform from the scale.

3. Turn the scale over on it's bottom and remove the six screws which hold the upper housing.

CAUTION
Use care in the next step as the keypad wiring is attached to the PC board.

4. Turn the scale over again to its normal upright position and carefully lift the upper housing from the bottom housing about two to three inches. Reach under the upper housing from the front and carefully disconnect the flexible cable from the PC board.

5. Carefully remove the wires coming from J4 which is used to connect to the loadcell. See figure 4-9 for wire color and locations.

6. Remove the four screws holding the Spider Assembly to the bottom housing.

7. Lift the Spider Assembly out of the bottom housing and replace with a new one.

9. Connect the color coded wiring from the loadcell to connector J4. Check that color coded wiring is correctly installed. See Figure 4-9.

10. Position the upper housing in place over the scale and connect the flexible cable from the keypad to the socket on the PC board.

11. Reassemble the scale by replacing the six screws at the bottom of the scale which secure the upper housing.

12. Replace the platform on top of the scale.

13. After installation, check all operations, if possible, set the original customer settings back into the scale and calibrate the scale.

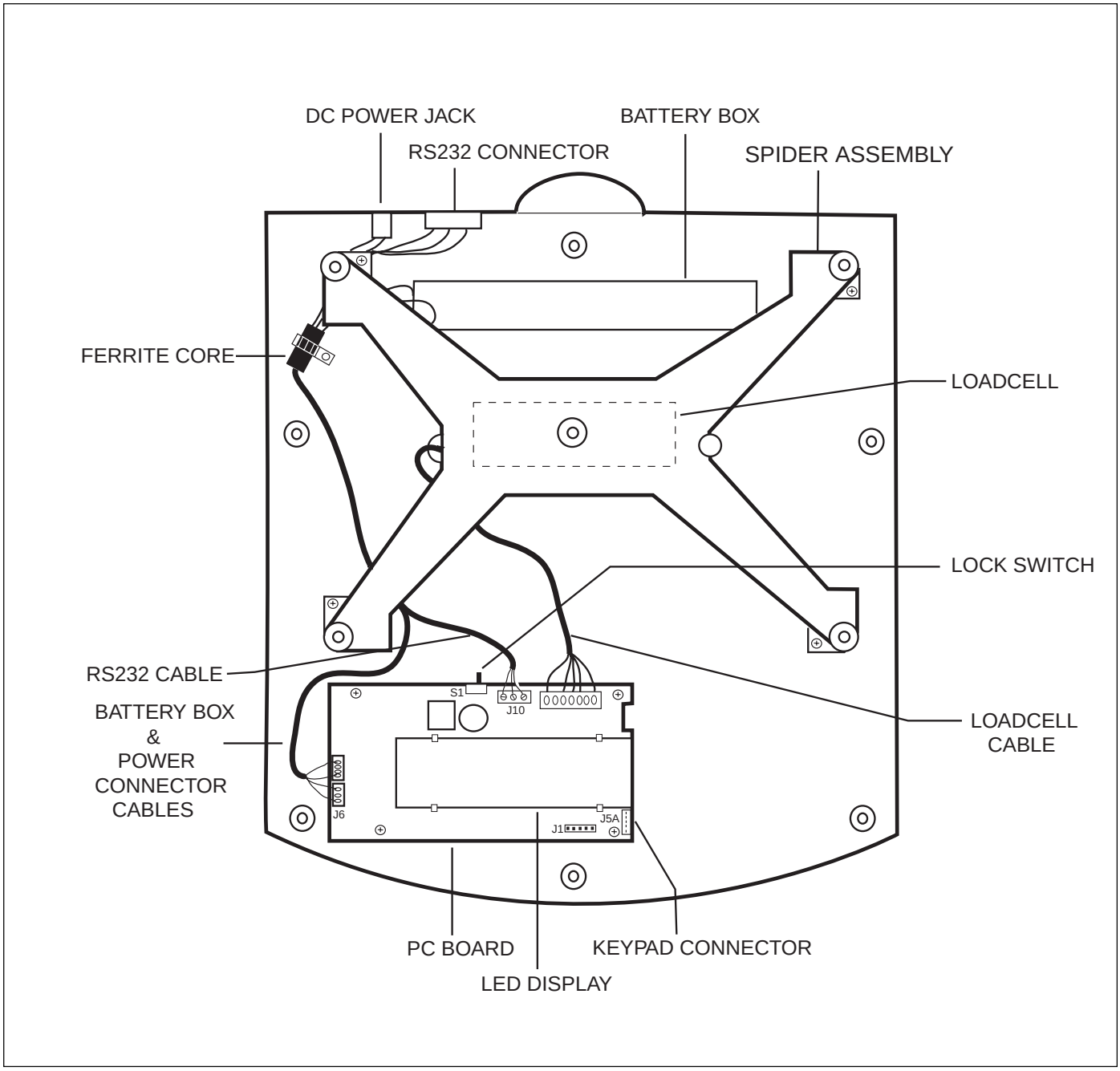


Figure 4-10. Trooper Component Locations.

5.1 DRAWINGS AND PARTS LISTS

This section of the manual contains an exploded view, schematic diagrams, interconnection diagram and a spare parts list for the Trooper scales. The exploded view drawing identifies the replaceable parts which can be serviced on the scale in the field.

NOTE:

In all cases where a part is replaced, the scale must be thoroughly checked after the replacement is made. The scale **MUST** meet the parameters of all applicable specifications in this manual.

If further technical information is needed, in the United States call toll-free 1-800-526-0659 between 8.00 a.m. and 4.00 p.m. EST. An Ohaus factory service technician will be available to provide assistance. Outside the U.S.A., please contact:

Ohaus Corporation
19A Chapin Road
P.O. Box 2033
Pine Brook, NJ 07058-2033, USA
Tel: (973) 377-9000,
Fax: (973) 593-0359

CHAPTER 5 DRAWINGS AND PARTS LISTS

5.1.1 Trooper Exploded View

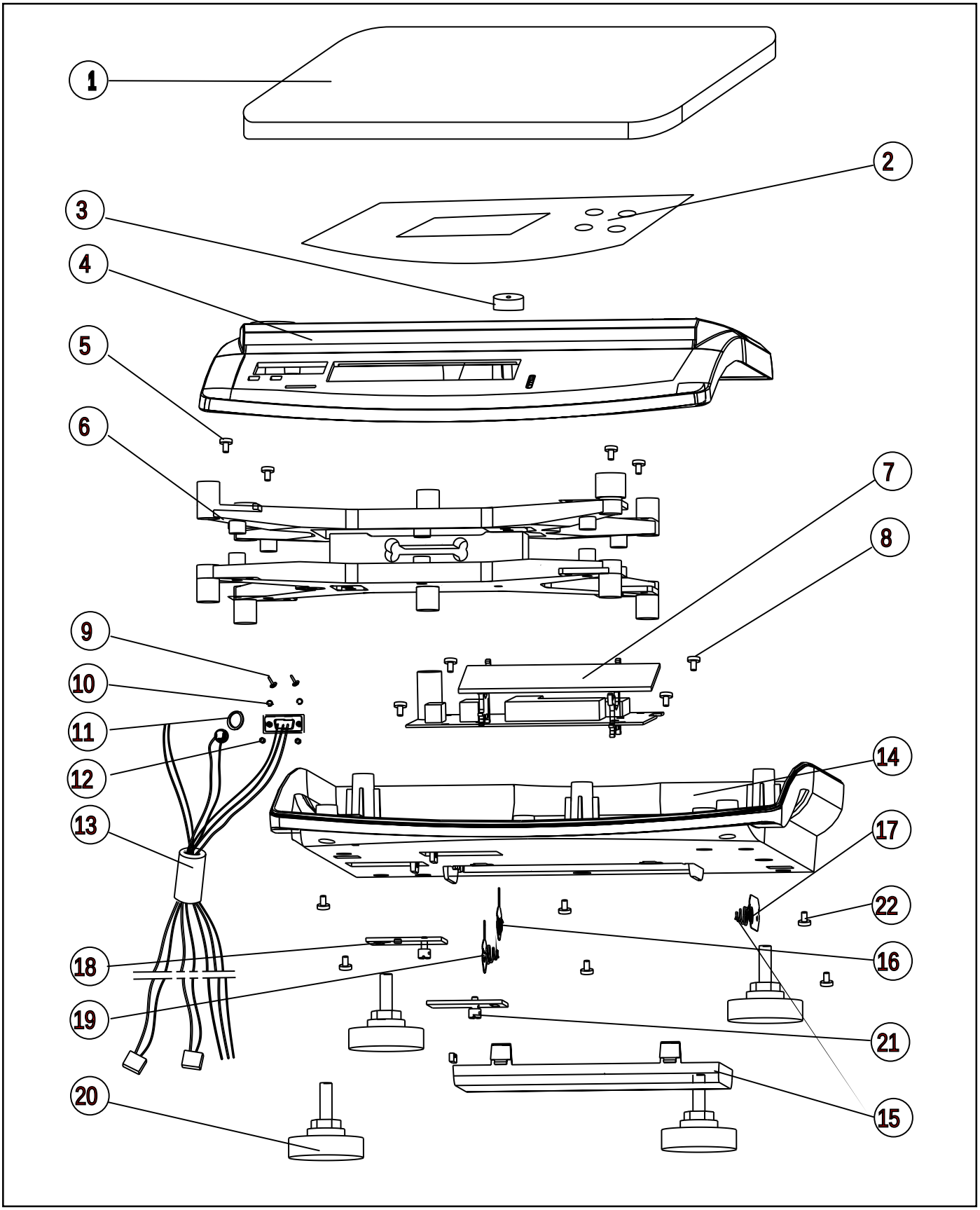


Figure 5-1. Exploded View of Trooper Scale.

TABLE 5-1. TROOPER PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION	QUANTITY
1	71133849	Assembly, Platter, Trooper	1
2	71133037	Keyboard & Overlay	1
3	71102326	Bubble Level, Dia. 16.5mm	1
4	71133034	Upper Housing, Trooper	1
5	- - - - - - - -	Screw, M4x8	4
6	71133746	Load Cell Assembly, 3kg, With Frame	1
6	71133747	Load Cell Assembly, 6kg, With Frame	1
6	71133748	Load Cell Assembly, 15kg, With Frame	1
6	71133749	Load Cell Assembly, 30kg, With Frame	1
7	71134281	Assembly, main PCB, Trooper	1
8	- - - - - - - -	Screw, M4x6	2
9	- - - - - - - -	Screw, M3x8	2
10	- - - - - - - -	Washer, Dia. 3mm	2
11	71121101	Nut, DS026AS	1
12	71102619	Nut, M3, GB6170-86	2
13	71133660	Harness, PWR/COM, Trooper	1
14	71133035	Bottom Housing, Trooper	1
15	71133036	Cover, Battery, Trooper	1
16	71127394	Reed, I, CD11	1
17	71127396	Reed, II CD11	1
18	71133155	Cover, sealing, Trooper	2
19	71127395	Reed, III, CD11	1
20	71115201	Foot, Tiger	4
21	71118549	Screw, Sealing, M4x8	2
22	- - - - - - - -	Screw, M4x8	6

NOTE: Items with no part number specified are non-proprietary and are not offered as available items.

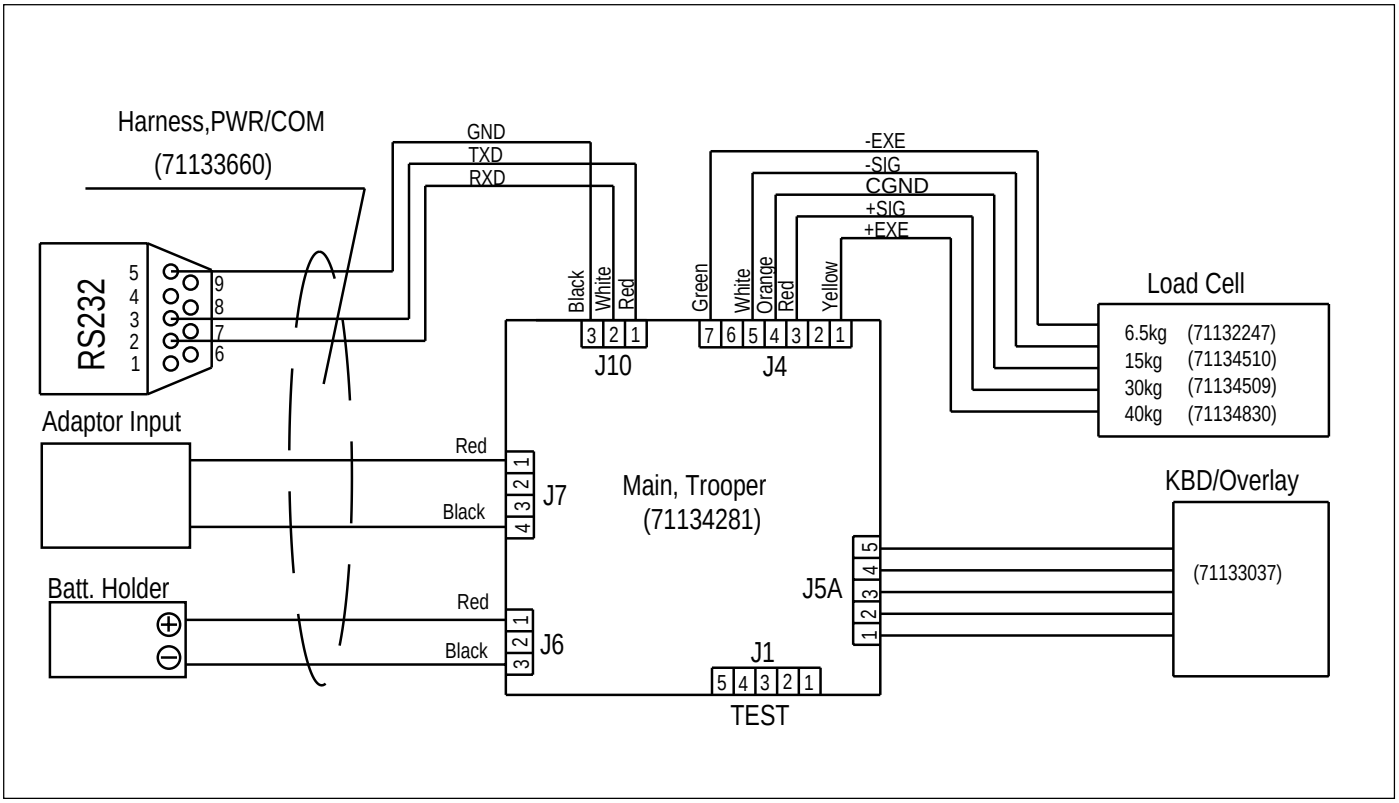


Figure 5-2. Trooper Scale Interconnection Diagram.

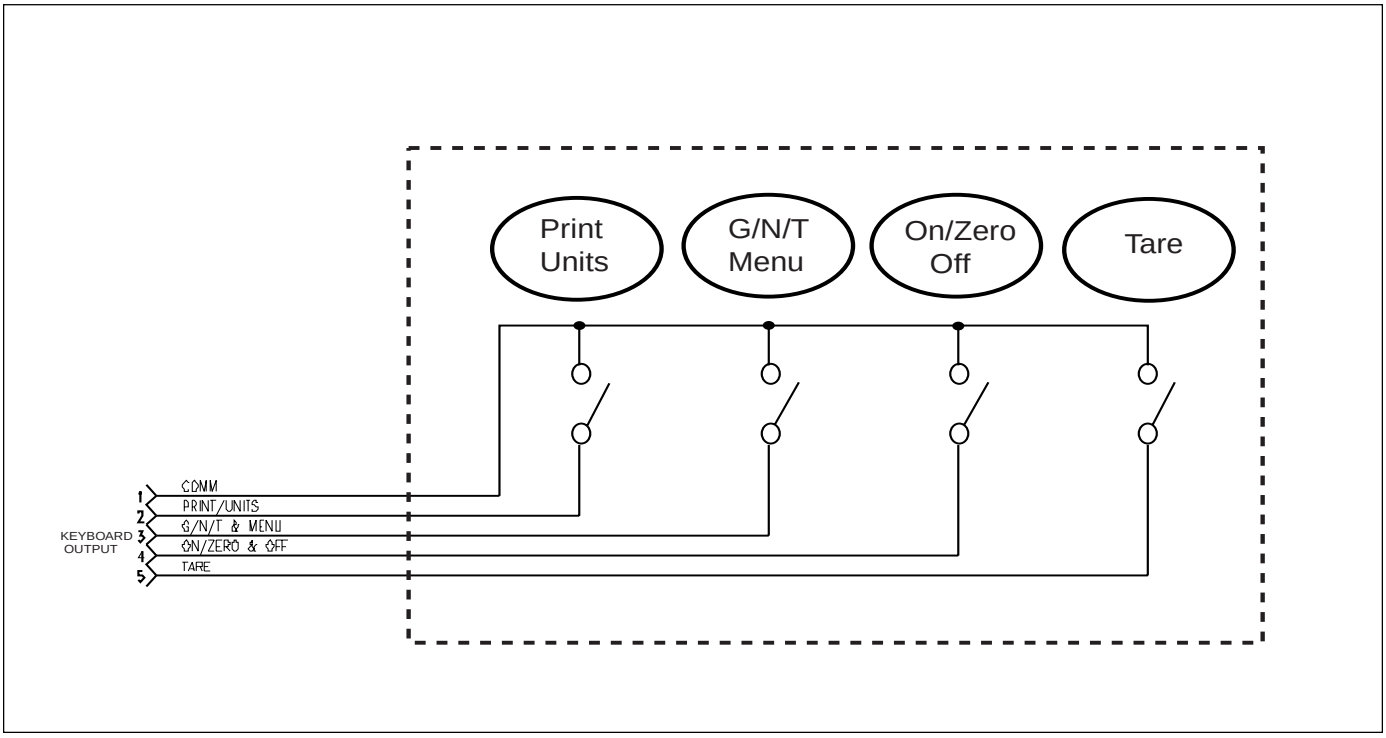


Figure 5-3. Keypad Wiring Diagram.